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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/736,266	12/15/2000	Adalbert Feltz		8730

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EXAMINER	
BLACKWELL RUDASIL, GWENDOLYN A	
ART UNIT	**PAPER NUMBER**
1775	

DATE MAILED: 10/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/736,266	FELTZ ET AL.	
	Examiner	Art Unit	
	Gwendolyn Blackwell	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *36-42 and 45-82* is/are pending in the application.

4a) Of the above claim(s) *36-42* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *45-79,81 and 82* is/are rejected.

7)☒ Claim(s) *80* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/05,8/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> *A person shall be entitled to a patent unless –*
>
> *(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.*

2. Claims 47, 59, 65, and 67-68 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent no. 5,233,260, Harada et al.

Regarding claim 47

Harada discloses a stack type piezoelectric element wherein plates of single or plural layers of a metallic material, such as copper or its alloys, are used as electrodes and interleaved with piezoelectric ceramic sheets, meeting the requirements of claim 47, (column 1, lines 40-65).

Regarding claims 59, 65, and 67-68

The ceramic has a ferroelectric perovskite type structure, (column 5, lines 40-43), wherein the ceramic follows the general formula ABO_3, meeting the requirements of claim 59, (column 7, lines 35-40). Examples of piezoelectric ceramics useful with the present invention are barium titanate ($BaTiO_3$), lead titanate ($PbTiO_3$), and lead titanate zirconate (PZT), meeting the requirements of claims 65 and 67-68, (column 7, lines 35-40).

Claim Rejections – 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 48-58, 60-64, 66, 69-79, and 81-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent no. 5,233,260, Harada et al as applied to claims 47, 59, 65, and 67-68 above, and further in view of United States Patent no. 4,128,489, Seo in view of United States Patent no. 4,917,810, Tsunooka et al, in view of United States Patent no. 5,112,433, Dawson et al, further in view of Untied States Patent no. 6,080,328, Horikawa.

Harada discloses a stack type piezoelectric element wherein plates of single or plural layers of a metallic material, such as copper or its alloys, are used as electrodes and interleaved with piezoelectric ceramic sheets, (column 1, lines 40-65). The ceramic has a ferroelectric perovskite type structure, (column 5, lines 40-43), wherein the ceramic follows the general formula ABO_3, meeting the requirements of claim 59, (column 7, lines 35-40). Examples of piezoelectric ceramics useful with the present invention are barium titanate ($BaTiO_3$), lead titanate ($PbTiO_3$), and lead titanate zirconate (PZT), (column 7, lines 35-40). Harada et al do not specifically disclose the composition of the perovskite structure or the grain size.

Seo discloses a piezoelectric material that utilizes a urethane rubber in the polymer binder mix, (column 2, lines 35-36). Further examples of the specific polymer that can be used are listed in Table 9, column 9. In addition, Example 7, set out that the formula of PZT satisfies the equation $Pb(Zr_2Ti_{1-x})O_3$, (column 8, lines 4-5).

Tsunooka et al discloses a piezoelectric composite material that can be used where "high piezoelectric properties may be required such as sonic transducers, physical property measurements, ferroelectric, pyroelectric or piezoelectric keyboard switches and so on," (column 26, lines 42-50). The composite contains ceramic powders that are "mixed with a wider variety of polymers," and molded into a shape, (column 5, lines 10-14). The particle size of the ceramic material ranges between 1-400 μ, (column 5, lines 28-38). As disclosed in the examples, in particular Example 1, the components of the ceramic powder should be 98% or higher in purity, (column 9, Example 1). Tsunooka et al also discloses that many different types of ceramic compositions that can be used. The perovskite structures that can be used are listed in columns 6-67, lines 62-67). For example, solid solutions of lead titanate zirconate are made. Along with

the lead titanate zirconate other cations can be present, on the A position, La, Na, K, or Bi can be present. On the B position, Nb, Ta, Mg, Ni, Co, Fe, Sc, or W can be present.

Dawson et al disclose submicron ceramic powder of perovskite compounds wherein the fine particle size of the powder is less than 1 with a sintering temperature of less than 1100°C, (column 2, lines 54-66). The perovskite structure can be based on barium titanate (BT), lead lanthanum zirconate titanate (PLZT), as well as lead zirconate titanate (PZT) wherein PZT describes the entire family of powders comprised of lead, zirconium, titanium and oxygen as principal elements, also including those compounds where the principal elements have been partially substituted with dopants, (columns 3-4, lines 1-46). The perovskite has the general formula of ABO_3 wherein is of the group barium, strontium, calcium, magnesium, lead, lanthanum, bismuth, cerium, neodymium, samarium and any or all of the B elements hafnium, zirconium, titanium, niobium, uranium, iron, antimony, nickel, manganese, cobalt, tungsten, and tin, (column 9, lines 22-35). Example 1 demonstrates that the grain size of the ceramic powder ranges from 0.5-1.0 microns (0.5-1.0 μm), (column 17, lines 26-34).

Horikawa discloses a monolithic piezoceramic part comprised of laminating ceramic green sheets with internal electrode layers with subsequent firing of the laminated stack to produce a sintered product. The ceramic has the formula $Pb_a[(Cr_xNb_{(1-x)})_yZr_{(1-b-y)}Ti_b]O_3$ wherein a copper component such as CuO can be added in the amount of about 0.05-3.0wt % (column 2, lines 39-68).

Seo, Tsunooka et al, Dawson et al and Horikawa disclose inventions related to perovskite compositions having a lowered sintering temperature. Harada et al disclose a piezoelectric part comprised of ceramic green sheets and electrodes such as copper that are sintered together to

create the piezoelectric structure. It would have been within the skill of one in the art at the time of invention to modify the piezoelectric part with one of the piezoelectric ceramic compositions of Seo, Tsunooka et al, Dawson et al or Horikawa to create a piezoelectric component wherein the electrodes can be fired at the same time as the green sheets to cut down on processing time as well as allowing less expensive materials to be used for the internal electrode materials, (Dawson et al, column 2, lines 63-66).

6. Claims 45-49, 59-60, 65, 67-74, and 82 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent no. 6,080,328, Horikawa et al in view of United States Patent no. 5,233,260, Harada et al.

Horikawa et al discloses a monolithic piezoceramic part comprised of laminating ceramic green sheets with internal electrode layers with subsequent firing of the laminated stack to produce a sintered product. The ceramic has the formula $Pb_a[(Cr_xNb_{(1-x)})_yZr_{(1-b-y)}Ti_b]O_3$ wherein a copper component such as CuO can be added in the amount of about 0.05-3.0wt % (column 2, lines 39-68). The ceramic contains a binder, (Example 4, column 4). The green sheets with the internal electrode layer should be fired at a temperature of 1100°C or less to produce the sintered product, (column 2, lines 15-20). Horikawa et al do not specifically disclose that copper is used as the internal electrode material.

Harada et al discloses a stack type piezoelectric element wherein plates of single or plural layers of a metallic material, such as copper or its alloys, are used as electrodes and interleaved with piezoelectric ceramic sheets, (column 1, lines 40-65). Examples of piezoelectric ceramics useful with the present invention are barium titanate ($BaTiO_3$), lead titanate ($PbTiO_3$), and lead

titanate zirconate (PZT), (column 7, lines 35-40). The copper is fired at a temperature of 700-1000°C, (column 9, lines 16-19).

Horikawa et al and Harada et al disclose analogous inventions drawn to the use of piezoelectric ceramic and metals used as internal electrodes. It would have been obvious to one skilled in the art at the time of invention to modify the monolithic piezoceramic structure of Horikawa et al by using the copper of Harada et al as the internal electrodes in order to fire the molded product at a temperature of less than 1100°C while using inexpensive materials.

Response to Arguments

7. Applicant's arguments filed July 13, 2005 have been fully considered but they are not persuasive.

8. Applicant contends that the device of USPN 5,233,260, Harada is not the same as the presently claimed invention in that the presently claimed invention is to a monolithic piezoelectric device while the device of Harada is not monolithic, which provides for a different structure and subsequent different properties..

This is not considered persuasive as Applicant has not provided objective evidence to the contrary demonstrating that the structure of Harada would not be a monolithic structure.

9. Applicant contends that USPN 4,128,489, Seo, does not teach a thermohydrolytic process for debindering and the some of the organic binder is still present in the finished product. Wherein the presently claimed invention there is no organic binder left.

This is not persuasive as there is no requirement in the claims for a thermohydrolytic process of debindering. There is also no requirement for the organic binder to be completely eliminated from the monolithic structure.

10. Applicant contends that USPN 6,080,328, Horikawa, does not provide details into the sintering process, does not teach the use of copper as an electrode, and based upon Applicant's assumptions as to the sintering atmosphere use of copper as an electrode would not be possible to use.

Horikawa may not go into detail about the sintering aspects of the process of making the invention, however, the presently claimed invention is drawn to an article not a method of making. Therefore the distinction between the process of making the Horikawa article and that of the presently claimed invention are not at issue.

It is mere speculation on the part of Applicant to assume that because Horikawa does not disclose a particular sintering process, than the piezoelectric element would have be fired in a regular ambient atmosphere, thereby excluding the use of copper as an electrode. There is nothing in the Horikawa reference that explicitly or implicitly excludes the use of copper as an electrode. The 1100 degrees Celsius temperature is an upper limit not the only temperature at which the piezoelectric ceramic element can be fired.

Harada is used to demonstrate that it is known in the art to use copper as an electrode material in a piezoelectric device, not for the way Harada is made.

11. For the reasons set forth above the rejections as stated above are maintained.

Allowable Subject Matter

12. Claim 80 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record do not teach or suggest a ceramic composition comprised of $Pb_{1-x-y}SE_xCu_yV''_{x/2}(Zr_{0.54-z}Ti_{0.46+z})O_3$.

Conclusion

13. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gwendolyn Blackwell whose telephone number is (571) 272-1533. The examiner can normally be reached on Monday - Thursday; 5:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gwendolyn Blackwell
Examiner
Art Unit 1775

gab

DEBORAH JONES
SUPERVISORY PATENT EXAMINER